

CLAIMS

1. A suspension system for a vehicle, wherein the vehicle has a knuckle and a frame, and wherein the suspension system comprises:

- 5 a) a vehicle suspension system control arm having a first portion attachable to the frame by a first control-arm bushing, having a second portion attachable to the frame by a second control-arm bushing, and having a third portion attachable to the knuckle by a ball joint;
- 10 b) a torsion spring assembly having a torsion tube and a torsion bar disposed within the torsion tube, wherein a first end portion of the torsion bar is attached to a first end portion of the torsion tube, wherein a second end portion of the torsion bar extends beyond a second end of the torsion tube and is attached to the control arm, and wherein no portion of the torsion tube is immobilized with respect to the frame; and
- 15 c) a moment bar having a first end portion attached to the torsion tube and having a second end portion attachable to the frame.

2. The suspension system of claim 1, wherein the vehicle has a longitudinal axis dividing the frame into a first side and a second side, wherein the first portion is attachable to the first side by the first control-arm bushing, wherein the second portion is attachable to the first side by the second control-arm bushing, and wherein the second end portion of the moment bar is attachable to the second side.

25 3. The suspension system of claim 2, including a vehicle suspension system same-side control arm attachable to the knuckle, and including a damper assembly operably connected to the control arm or the same-side control arm.

30 4. The suspension system of claim 3, wherein the control arm is a lower control arm, and wherein the same-side control arm is an upper control arm.

5. The suspension system of claim 1, wherein the moment bar is a substantially transversely extending moment bar, and wherein the first end portion of the moment bar is attached to the torsion tube proximate the second end of the torsion tube.

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6. The suspension system of claim 1, also including a vehicle suspension system additional control arm which is a substantial mirror image about the longitudinal axis of the control arm and including an additional torsion spring assembly which is a substantial mirror image about the longitudinal axis of the torsion spring assembly, and wherein the second end portion of the moment bar is attached to the torsion tube of the additional torsion spring assembly.

10 7. The suspension system of claim 6, wherein the moment bar includes an outer portion and an inner portion disposed coaxially and slideably within the outer portion, wherein the first end portion of the moment bar is an end portion of the outer portion, and wherein the second end portion of the moment bar is an end portion of the inner portion.

15 8. The suspension system of claim 7, wherein the moment bar includes an elastomer disposed between the inner and outer portions.

9. The suspension system of claim 1, wherein the torsion tube and the moment bar lie substantially in a horizontal plane when the vehicle is horizontal.

20 25 10. A suspension system for a vehicle, wherein the vehicle has a knuckle and a frame, and wherein the suspension system comprises:

a) a vehicle suspension system control arm having a first portion attachable to the frame by a first control-arm bushing, having a second portion attachable to the frame by a second control-arm bushing, and having a third portion attachable to the knuckle by a ball joint;

b) a torsion spring assembly having a torsion tube and a torsion bar disposed within the torsion tube, wherein a first end portion of the torsion bar is

attached to a first end portion of the torsion tube, wherein a second end portion of the torsion bar extends beyond a second end of the torsion tube and is attached to the control arm, and wherein no portion of the torsion tube is immobilized with respect to the frame;

5 c) a moment bar having a first end portion attached to the torsion tube and having a second end portion attachable to the frame; and

 d) a rotary damper assembly operably connected to the torsion tube and the torsion bar.

10 11. The suspension system of claim 10, wherein the vehicle has a longitudinal axis dividing the frame into a first side and a second side, wherein the first portion is attachable to the first side by the first control-arm bushing, wherein the second portion is attachable to the first side by the second control-arm bushing, and wherein the second end portion of the moment bar is attachable to the second side.

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12. The suspension system of claim 11, including a vehicle suspension system same-side control arm attachable to the knuckle, and including a damper assembly operably connected to the control arm or the same-side control arm.

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13. The suspension system of claim 12, wherein the control arm is a lower control arm, and wherein the same-side control arm is an upper control arm.

14. The suspension system of claim 10 wherein the moment bar is a substantially transversely extending moment bar, and wherein the first end portion of the moment bar is attached to the torsion tube proximate the second end of the torsion tube.

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15. The suspension system of claim 10, also including a vehicle suspension system additional control arm which is a substantial mirror image about the longitudinal axis of the control arm and including an additional torsion spring assembly which is a substantial mirror image about the longitudinal axis of the

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torsion spring assembly, and wherein the second end portion of the moment bar is attached to the torsion tube of the additional torsion spring assembly.

16. The suspension system of claim 15, wherein the moment bar includes an outer portion and an inner portion disposed coaxially and slideably within the outer portion, wherein the first end portion of the moment bar is an end portion of the outer portion, and wherein the second end portion of the moment bar is an end portion of the inner portion.
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17. The suspension system of claim 16, wherein the moment bar includes an elastomer disposed between the inner and outer portions.
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18. The suspension system of claim 10, wherein the torsion tube and the moment bar lie substantially in a horizontal plane when the vehicle is horizontal.
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19. A suspension system for a vehicle, wherein the vehicle has a knuckle and a frame, and wherein the suspension system comprises:
 - a) a vehicle suspension system control arm having a first portion attachable to the frame by a first control-arm bushing, having a second portion attachable to the frame by a second control-arm bushing, and having a third portion attachable to the knuckle by a ball joint;
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 - b) a torsion spring assembly having a torsion tube and a torsion bar disposed within the torsion tube, wherein a first end portion of the torsion bar is attached to a first end portion of the torsion tube, wherein a second end portion of the torsion bar extends beyond a second end of the torsion tube and is attached to the control arm, and wherein no portion of the torsion tube is immobilized with respect to the frame;
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 - c) a moment bar having a first end portion attached to the torsion tube and having a second end portion attachable to the frame and
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- d) a controllable rotary damper assembly operably connected to the torsion tube and the torsion bar and operably connectable to an electronic control unit of a vehicle suspension control system.

5 20. The suspension system of claim 19, wherein the controllable rotary damper assembly is a magnetorheological rotary damper assembly.